Approximate global minimizers to pairwise interaction problems by a convex/non-convex energy decomposition

David Shirokoff, NJIT

A wide range of material systems exhibit energy driven pattern formation governed by an underlying non-convex energy functional. Although numerically finding and verifying local minima to these functionals is relatively straight-forward, the computation and verification of global minimizers is much more difficult. Here the verification of global minimizers is often important in understanding the material phase diagram, or bulk statistical properties, especially at low temperatures. In this talk I will examine a general class of model functionals: those arising in non-local pairwise interaction problems. I will present a new approach for computing approximate global minimizers based on a new convex/non-convex splitting of the energy functional that arises from a convex relaxation. The approach provides a sufficient condition for global minimizers that may in some cases be used to show that lattices are exact, and also be used to estimate the optimality of approximate minimizers. Physically, the approach identifies the emergence of new length scales seen in the collective behavior of interacting particles. Phase diagram computations and numerical examples will be discussed in dimensions one and two.

Thursday, October 20th, 2016 at 1:00 PM.  
Korman Center, Room 245.

www.math.drexel.edu/~jdoug/seminar/  
simpson@math.drexel.edu